

100TH CONGRESS }
2d Session

SENATE

{ REPORT
100-331

NATIONAL SCIENCE FOUNDATION
AUTHORIZATION ACT

Mr. HOLLINGS, from the Committee on Commerce, Science,
and Transportation, submitted the following

R E P O R T

together with

ADDITIONAL VIEWS

OF THE

SENATE COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION

ON

S. 1632



MAY 9, 1988.—Ordered to be printed

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NATIONAL SCIENCE FOUNDATION AUTHORIZATION ACT

MAY 9, 1988.—Ordered to be printed

Mr. HOLLINGS, from the Committee on Commerce, Science, and Transportation, submitted the following

REPORT

together with

ADDITIONAL VIEWS

[To accompany S. 1632]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 1632) to authorize appropriations for the National Science Foundation for fiscal years 1988 through 1992, having considered the same, reports favorably thereon with amendments and an amendment to the title and recommends that the bill do pass.

PURPOSE OF THE BILL

The bill as amended authorizes appropriations for the National Science Foundation (NSF) of \$2,050,000,000 for fiscal year (FY) 1989; \$2,158,000,000 for FY 1990; \$2,474,000,000 for FY 1991; \$2,831,000,000 for FY 1992; and \$3,245,000,000 for FY 1993. It also establishes several new programs at NSF (an Academic Research Facilities Modernization Program, an Undergraduate Science and Engineering Improvement Program, and a College and University Innovation Research Program) and continues the Experimental Program to Stimulate Competitive Research.

BACKGROUND AND NEEDS

NSF is an independent Federal agency established by the National Science Foundation Act of 1950. NSF is unique among Federal agencies in that its primary purpose is to support basic research

in all fields of science and engineering. This is in contrast to other agencies, which support research related to their specific missions. NSF funds basic research through grants and other award mechanisms to more than 2,000 colleges and universities and other research institutions in all parts of the United States. NSF selects projects for support after having evaluated the submitted proposals on the basis of merit as determined by the peer review process.

Although NSF represents only about 3 percent of total Federal spending on research and development, it is the primary source of support for fundamental research in U.S. colleges and universities. These academic institutions perform most of the Nation's basic research, and train most of the scientists and engineers who staff our industrial, academic, and Government laboratories.

By establishing NSF in 1950, and by continuing to support it, Congress recognizes that support of long-term fundamental research contributes to the strength and well-being of the Nation in many ways. The Nation benefits from significant advances in the fields of science and engineering, although the specifics can seldom be foreseen. These advances contribute to progress in many important areas of Federal responsibility, such as health, environmental, and agricultural research, national defense, and our space program.

More importantly, however, basic research is the foundation upon which our technologically advanced economy is built. Technology, as the 1986 report of the President's Commission on Industrial Competitiveness stressed, remains this country's strongest competitive advantage.

However, the United States can no longer take its world lead in science and technology for granted. In 1986, for the first time, the United States experienced a trade deficit in high-technology products. The country now faces serious industrial and technological challenges across the industrial spectrum—from traditional industries such as steel, automobiles, and textiles to newer sectors such as semiconductors, biotechnology, and advanced computers.

Science is also important to understanding and responding to important environmental and social problems. For all of these reasons, the Committee believes that NSF and its programs merit strong support.

The U.S. academic research system also faces certain problems, and the Committee believes that strengthened NSF programs can help address them. The Committee's amendments would increase NSF's role in three areas where shortcomings now exist: help universities and colleges renovate obsolete research facilities, assist academic institutions and States which have historically received relatively little Federal research funding to strengthen their research programs and infrastructure, and provide additional opportunities for faculty with research ideas which may have economic potential.

LEGISLATIVE HISTORY

The Committee on Labor and Human Resources reported S. 1632 as an original bill on August 7, 1987 (Senate Report 100-148). Pursuant to an agreement between the Committee on Labor and

Human Resources and this Committee, which was approved by the Senate on March 3, 1988, S. 1632 was referred to this Committee on March 3, 1988, for 30 days, not including days when the Senate is not in session. The Committee held a hearing on April 14, 1988.

On April 26, 1988, the Committee considered a staff draft of amendments to the Labor Committee-reported bill, and also considered three further amendments—an amendment by Senator Exon to create a new College and University Innovation Research Program, an amendment by Senators Rockefeller and Pressler regarding the Experimental Program to Stimulate Competitive Research, and an amendment by Senator Wilson regarding research in earthquake engineering. The Committee adopted the three amendments and, without objection, ordered the bill reported favorably with amendments.

SUMMARY OF MAJOR PROVISIONS

As reported, the Committee amendments to S. 1632 would:

1. Authorize appropriations for NSF for FY 1989 through 1993;

2. Amend the National Science Foundation Act of 1950 by adding a new provision stating that one function of NSF is to foster and support efforts by those academic institutions and States which historically have received little Federal research funding to improve their research and research infrastructures;

3. Establish a new NSF Academic Research Facilities Modernization Program to help universities and colleges renovate obsolete laboratories and other research facilities;

4. Establish an NSF Undergraduate Science and Engineering Improvement Program to improve equipment and research support at predominantly undergraduate institutions;

5. Establish a new NSF College and University Innovation Research Program to assist academic researchers at a wide range of colleges and universities to pursue high-quality research of economic potential;

6. Extend the existing NSF Experimental Program to Stimulate Competitive Research to assist those States which have historically received little Federal research funding to build their research capabilities; and

7. Direct the National Academy of Sciences to conduct a study of earthquake engineering research efforts, and direct NSF to ensure that its evaluation of the National Center for Earthquake Engineering Research be conducted by an independent review panel.

ESTIMATED COSTS

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, April 29, 1988.

Hon. ERNEST F. HOLLINGS,
Chairman, Committee on Commerce, Science, and Transportation,
U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the attached cost estimate for S. 1632, a bill to authorize appropriations for the National Science Foundation, and for other purposes.

If you wish further details on this estimate, we will be pleased to provide them.

Sincerely,

JAMES L. BLUM,
Acting Director.

CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

1. Bill number: S. 1632.
2. Bill title: A bill to authorize appropriations for the National Science Foundation, and for other purposes.
3. Bill status: As ordered reported by the Senate Committee on Commerce, Science, and Transportation, April 26, 1988.
4. Bill purpose: S. 1632 would authorize appropriations for the National Science Foundation (NSF) for fiscal years 1989 through 1993.

The bill would also authorize the NSF to establish the College and University Innovation Research Program, which would provide forgivable loans for product development to researchers at colleges and universities. To fund these loans in 1989, S. 1632 would allocate \$5 million of the total authorization to a new revolving fund. All loan repayments or other collections would be deposited into the fund and could be used to support additional loans. Unless the program were extended by future statute beyond its five-year authorization, any excess funds remaining at that time would be transferred to the Treasury.

5. Estimated cost to the Federal Government:

[By fiscal year, in millions of dollars]

	1989	1990	1991	1992	1993
Authorization level.....	2,050	2,158	2,474	2,831	3,245
Estimated outlays.....	966	1,909	2,259	2,611	2,987

The costs of this bill fall within budget function 250. Including outlays from prior year appropriations, total outlays would be \$1,871 million in 1989, assuming appropriation of the authorized amount.

Basis of estimate: This estimate assumes that the full amounts authorized would be appropriated for each fiscal year. The estimated outlays for current NSF programs are based on historical spending patterns.

Based on information provided by the NSF, we expect that outlays from the revolving fund established for the College and University Innovation Research Program would be similar to those for existing NSF grant programs. The above table does not include any estimate of collections to the revolving fund, however, because repayments are expected to be limited over the next five years.

6. Estimated cost to State and local governments: None.
7. Estimate comparison: None.
8. Previous CBO estimate: None.
9. Estimate prepared by: Michael Sieverts.
10. Estimate approved by: James L. Blum, Assistant Director for Budget Analysis.

REGULATORY IMPACT STATEMENT

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation.

The amendments to S. 1632 would provide authorization of appropriation to NSF and extends for 5 years existing programs supported by NSF. The bill confers no new regulatory authority on NSF. Implementation of S. 1632 will not increase Federal regulation of any individuals or businesses, and thus in this respect will not result in increased Federal regulation, economic effect, impact on personal privacy, or additional paperwork.

The amendments do create new award programs at NSF, and the Committee anticipates that colleges, universities, and individual researchers will choose to apply for these awards. However, they will do so voluntarily.

Private parties who choose to apply for awards under the College and University Innovation Research Program proposed under title IV of the amended bill may have to report inventions, patents, and royalties, and be subject to similar intrusions into their privacy. These will be voluntary arrangements, however, and the terms will be negotiated before entering into any agreements.

In terms of paperwork, the amendments and the Committee report require NSF to submit four reports: a report on supercomputing, due March 1, 1989; a report presenting the program plan for the Academic Research Facilities Modernization Program, due March 31, 1989; a report within one year of the date of enactment describing procedures, terms, and conditions for the new College and University Innovation Research Program; and a report three years after the date of enactment evaluating the College and University Innovation Research Program and making recommendations. The amendments also require a report from the National Academy of Sciences regarding research efforts in earthquake engineering.

SECTION-BY-SECTION ANALYSIS

Section 1.—Short Title

The Committee amendments amend the short title of the bill to read as the "National Science Foundation Authorization Act of 1988".

TITLE I — NATIONAL SCIENCE FOUNDATION AUTHORIZATIONS

Section 101.—Authorization of Appropriations

The Committee amendments do not substantively amend section 101(a) of S. 1632.

The Committee amendments do amend subsection (b). As amended, subsection (b) authorizes to be appropriated to NSF \$2,050,000,000 for FY 1989. The amended language makes the FY 1989 authorization available for the following NSF categories:

- (1) Mathematical and Physical Sciences, \$502,761,000.
- (2) Engineering, \$194,964,000.
- (3) Biological, Behavioral, and Social Sciences, \$288,737,000.
- (4) Geosciences, \$320,876,000.
- (5) Computer and Information Science and Engineering, \$149,126,000.
- (6) Scientific, Technological, and International Affairs, \$50,986,000.
- (7) Science and Technology Research Centers, \$30,000,000.
- (8) High-Priority Programs, \$70,000,000, of which \$6,000,000 shall be available for additional support in Materials Research, with an emphasis on research in high-temperature superconductivity; \$3,000,000 shall be available for additional research in Ocean Engineering Systems; \$3,000,000 shall be available for additional research in Design, Manufacturing, and Computer-Integrated Engineering; \$8,000,000 shall be available for additional support of Cross-Disciplinary Engineering Research; \$5,000,000 shall be available for additional research in Geosciences; \$6,000,000 shall be available for additional support of Research Initiation; \$4,000,000 shall be available for additional support of the Experimental Program to Stimulate Competitive Research; \$5,000,000 shall be available for a College and University Innovation Research Program; and \$30,000,000 shall be available for additional support of Undergraduate Science and Engineering Improvement.
- (9) Academic Research Facilities Modernization, \$50,000,000.
- (10) Program Development and Management, \$95,550,000.
- (11) United States Antarctic Program, \$141,000,000.

This subsection makes no provision for funding availability for Science and Engineering Education because that activity is solely within the jurisdiction of the Committee on Labor and Human Resources.

The Committee is pleased to support the requested increase for NSF of 19 percent over the FY 1988 program level. The Committee agrees with the high priority accorded to research activities which contribute to economic competitiveness and the general welfare.

However, the Committee recommends certain reallocations within the FY 1989 total requested by the President. Specifically, the Committee amendments recommend \$30,000,000 for the new Science and Technology Research Centers Program, rather than the \$150,000,000 requested. The Committee recommends allocating the remaining \$120,000,000 in two ways—\$70,000,000 for high-priority programs, \$40,000,000 of which is for selected increases in NSF research programs and \$30,000,000 to increase support for Under-

graduate Science and Engineering Improvement; and \$50,000,000 for a new Academic Research Facilities Modernization Program.

The following discussion outlines the Committee's specific views regarding both NSF's FY 1989 request and these specific reallocations.

Science and Technology Research Centers.—The Committee supports NSF's initiative to create new Science and Technology Research Centers. These centers will permit focused multidisciplinary research on important scientific and technical questions and, in many cases, will facilitate greater interaction between universities and U.S. companies. The authorization of \$30,000,000 will permit NSF to establish 10–15 centers. The Committee is pleased that NSF has requested new funds and a new line item for the centers program, separate from those accounts which support individual investigators. The Committee endorses NSF's proposal to provide regular evaluations of the new centers; these evaluations will help ensure high-quality research.

While the Committee supports this initiative, it does not agree that an entire five years of funding for the program should be provided in FY 1989. Rather than providing all funding up front, the Committee believes that the new program should be funded on an annual basis, as are all other NSF activities. For this reason, the Committee recommends not \$150,000,000, as requested, but rather the \$30,000,000 necessary to fund first-year operations.

NSF has not pre-selected topics for the proposed Science and Technology Research Centers. The Committee urges NSF to consider the recommendation of the 1986 White House Science Council report, "A Renewed Partnership" (Packard-Bromley report). That report called for a series of "university-based interdisciplinary, problem-oriented research and technology centers directed to problems of broad national needs and relevant to industrial technology" (page 17). The Committee believes that the new centers program will be of most value to the Nation if it, on balance, funds high-quality centers focused on subjects related to economic competitiveness and other urgent national problems.

Mathematical and Physical Sciences.—The Committee endorses the requested amount for this NSF directorate. In addition, the Committee also recommends an extra \$6,000,000 for Materials Research and recommends that these extra funds be used for further research on high-temperature superconductivity. While high-temperature superconductivity remains a new field, with commercial applications some years away, the Committee notes the intense research efforts in other countries to turn these new discoveries into usable products. The Committee believes that additional basic research in this promising field is an important investment in the Nation's economic future.

Engineering.—Along with endorsing the FY 1989 request for the NSF Engineering Directorate, the Committee recommends additional funds in three high-priority areas: Cross-Disciplinary Research (the Engineering Research Center Program); Design, Manufacturing, and Computer-Integrated Engineering; and Ocean Engineering Systems.

The additional \$8,000,000 recommended for Cross-Disciplinary Research would bring the FY 1989 authorization for this program

up to the level NSF itself requested in its FY 1988 budget estimate. The Committee has strongly supported the Engineering Research Center Program because of its focus on multidisciplinary research and education in important technical areas, because it strongly links universities and American companies, and because of the way it leverages Federal monies by encouraging corporate matching funds. In providing additional funds for the program, the Committee urges NSF to choose, among those proposals highly ranked by merit reviewers, those center proposals which focus on technologies and industries of particular importance to U.S. industrial competitiveness, including both traditional and newer industries.

The Committee recommends an additional \$3,000,000 for research in Design, Manufacturing, and Computer-Integrated Engineering. Many observers believe that improved manufacturing technology is a key to improved U.S. economic performance. Yet research in this critical area has lagged. The report of the President's Commission on Industrial Competitiveness (page 20) stated the problem this way: "Manufacturing technology needs more emphasis. Perhaps the most glaring deficiency in America's technological capabilities has been our failure to devote enough attention to manufacturing or process technology." A recent report by the National Academy of Engineering, entitled "Directions in Engineering Research," named manufacturing, along with advanced materials and computer software, as the highest priorities in U.S. engineering research.

Finally, the Committee recommends an additional \$3,000,000 for Ocean Engineering Systems. The United States now has an Exclusive Economic Zone (EEZ) out to 200 nautical miles off our shores, including zones surrounding major U.S. islands. This huge ocean area now under U.S. jurisdiction—3,362,600 square nautical miles—contains great resources, including large mineral deposits and considerable energy potential. These resources are particularly large in the Pacific Basin, which contains 85 percent of the entire U.S. EEZ. These great resources would become even more valuable if new technologies can be developed to extract and process them more economically. Therefore, the Committee directs that these additional funds be used to support additional ocean engineering research and urges NSF to pay particular attention to the needs and technical opportunities of ocean engineering efforts in the Pacific Basin.

Biological, Behavioral, and Social Sciences.—The Committee recommends the requested FY 1989 amount for this directorate. These programs are valuable and deserve continued and expanded support. The Committee supports NSF's efforts to maintain three important social science data bases; these are unique national resources which provide long-term data unavailable elsewhere regarding American political behavior, social change, and the economy.

Geosciences.—In addition to endorsing the requested level for the Geosciences Directorate, the Committee also provides \$5,000,000 in order to support further basic research in two areas of national importance—global geosciences and natural hazards.

The Committee strongly supports NSF's Global Geosciences initiative. A recent analysis by the National Aeronautics and Space Ad-

ministration suggests that depletion of the earth's protective ozone layer is occurring more quickly than previously thought, and other studies confirm that the earth's average temperature is rising, perhaps due to the "greenhouse effect" caused by the build-up of atmospheric carbon dioxide and other gases. The Committee believes that new theories of global processes, coupled with new satellite capabilities and advanced computer models, offer a major opportunity to understand these important changes in global climate and processes.

Geosciences research also is an important component of the Nation's efforts to lessen the damage caused by natural disasters, such as earthquakes, volcanoes, hurricanes, tornadoes, and floods. Further research in geology, geophysics, and meteorology will help provide the scientific understanding needed to assess and reduce the risks posed by these often deadly events.

Computer and Information Science and Engineering.—The Committee recommends the requested level of FY 1989 funding. The Committee strongly supports the Advanced Scientific Computing Program, particularly the five national supercomputer centers funded under that program. Supercomputers make possible major advances in both scientific modeling and engineering design.

Since these five centers now operate supercomputers which are several years old, the Committee directs NSF to submit a report to the Committee by March 1, 1989, on needs and opportunities in academic supercomputing as well as options to improve the supercomputing services available to current users, including academic researchers and researchers from the business community. The Committee directs NSF particularly to consider available options, and associated benefits and costs, for upgrading centers by purchasing new generations of machines.

Scientific, Technological, and International Affairs.—In addition to recommending the requested level of funding for this directorate, the Committee amendments also recommend additional funding in two high priority areas: Research Initiation and a new College and University Innovation Research Program.

Research Initiation funds activities to help improve the research capabilities of underrepresented minorities and women. The Committee recommendation includes an additional \$6,000,000 for these activities. The Committee considers this program to be of the highest national importance.

Blacks, Hispanics, several other minorities, and women remain underrepresented in American science and engineering. In 1986, according to "Science and Engineering Indicators—1987", blacks accounted for only 2.5 percent of employed scientists and engineers, even though black Americans represented 10 percent of total U.S. employment and almost 6 percent of all professionals. Hispanics represented about 2.1 percent of employed scientists and engineers, while comprising 5 percent of all employed persons. While the percentage of women in science and engineering rose from 8 percent in 1976 to 13 percent in 1986, they are still severely underrepresented given that women now make up half of the entire U.S. workforce.

At the same time, colleges and universities which historically have trained large numbers of minority students often lack re-

search funds and equipment. This is particularly regrettable, since testimony before the Committee suggests that the opportunity to watch and participate in faculty research projects is one of the best ways to draw students, particularly undergraduates, to science and keep them interested in it.

In an era when social opportunity is more tied to education than ever before, and in an era when the pool of young people is shrinking, a Nation concerned about both national competitiveness and equal opportunity must provide additional high-quality research support for faculty and students from underrepresented groups. For these reasons, the Committee believes that NSF's Research Initiation activities must be expanded. The Committee commends NSF for its efforts in this area.

The Committee also supports the creation of a new College and University Innovation Research Program (CUIR) to assist academic researchers at a wide range of colleges and universities to pursue high-quality research of economic potential. Such a program would be established under title IV of the Committee's amendments.

Experimental Program to Stimulate Competitive Research.—The Committee also supports NSF's Experimental Program to Stimulate Competitive Research (EPSCOR), a program which helps strengthen academic research in those States which historically have received the least Federal research funding. EPSCOR ensures that these States have an opportunity to build strong science and engineering programs.

EPSCOR is a "distributed program," meaning that funds are not authorized in a single line-item but rather distributed among the various NSF research directorates and included in their line-items. For FY 1989 the President requested \$8,000,000 for the program. The Committee recommends an additional \$4,000,000.

Undergraduate Science and Engineering Improvement.—The Committee applauds the National Science Board report on undergraduate science and engineering. The Committee supports the recommendations made to the States, academic institutions, the private sector, and the mission agencies. The Committee believes NSF's role should be to provide strong and leveraged program support. The Committee believes that an important and valuable linkage exists between the research and educational processes which go on at this country's undergraduate institutions. As such, the Committee believes the research directorates have the prime responsibility within NSF for the support of many of the undergraduate activities recommended by the National Science Board's task committee on the subject of undergraduate science and engineering. The Committee looks forward to reviewing the development of NSF's activities in this important area.

The Committee strongly supports NSF efforts to provide additional support for undergraduate science and engineering programs, particularly efforts to provide undergraduate programs with up-to-date research equipment. Good undergraduate programs are essential if the Nation is to train future generations of scientists and engineers, and if all groups of citizens and regions of the country are to have full educational opportunities.

NSF operates its undergraduate activities as a "distributed activity," with funding spread throughout NSF's research directorates.

For FY 1989 the President requested \$64,900,000 for the distributed undergraduate activities. The Committee recommends an additional \$30,000,000, bringing the proposed FY 1989 authorization to \$94,900,000. The National Science Board report recommended that NSF undergraduate science and technology programs be increased to \$100,000,000. In adding to the authorization, the Committee urges NSF to pay particular attention to the research equipment needs of undergraduate programs.

Academic Research Facilities Modernization.—The Committee amendments recommend \$50,000,000 for the new Academic Research Facilities Modernization Program that would be established under title II of the amendments. Title II requires that NSF submit a report containing the program's proposed program plan to Congressional authorizing committees by March 31, 1989. The Committee directs that NSF not obligate any of the funds that might be appropriated subject to this authorization until the program plan is completed and transmitted to Congress. However, of the FY 1989 appropriations authorized under section 101(b), funds not to exceed \$1,000,000 are authorized to prepare the program plan.

U.S. Antarctic Program.—The Committee amendments authorize appropriations at the FY 1989 requested level. The research and U.S. presence supported by the Antarctic Program are now more important than ever. Recent research has shown that an annual "hole" develops in the stratospheric ozone layer above the continent. Understanding that phenomenon is one key to unraveling the larger mystery of human-induced changes in the global environment. In addition, the United States must maintain an active and influential presence in Antarctica, especially at a time when changes in the Antarctic Treaty are contemplated.

The Committee recognizes that the ships, aircraft, and facilities used by the U.S. Antarctic Program are mostly old and in need of either repair or replacement. The additional funds requested in the FY 1989 budget estimate would help pay for those necessary upgrades.

The Committee amendments also add a new section 101(c), which provides NSF with authorizations for appropriations for FY 1990 through 1993. These proposed authorizations endorse NSF's request to double the NSF budget over the next five years. For each year, the subsection provides a total but then adds that the specific amounts of these funds to be available for specific program activities shall be specified in future authorization Acts. The totals are:

- (1) For FY 1990, \$2,158,000,000.
- (2) For FY 1991, \$2,474,000,000.
- (3) For FY 1992, \$2,831,000,000.
- (4) For FY 1993, \$3,245,000,000.

New section 101(d)(1) provides that to the extent that the total amount appropriated to carry out program activities specified in this title is less than the total amount authorized to be appropriated for such activities under this title, all such authorized amounts, including floors and ceilings, for such activities or their subactivities shall be reduced proportionally. Section 101(d)(2) of the amended bill is the original text of section 101(c)(2) of the Labor Committee-reported bill; the Committee made no amendments, despite a need for cross-reference corrections, because the

provision is within the sole jurisdiction of the Committee on Labor and Human Resources.

Sections 102-105

The Committee amendments make no changes in section 102 through 105 of the Labor Committee-reported bill. These sections deal with availability of appropriations, consultation and representation expenses, transfer of funds, and administrative amendments.

Section 106.—Temporary Personnel

New section 106 amends current law regarding temporary employees of NSF. It provides that the Director of NSF may appoint for a limited term, or on a temporary basis, scientists, engineers, and other technical and professional personnel on leave of absence from academic, industrial, or research institutions to work for NSF.

Moreover, NSF may pay, to the extent authorized by law for certain other Federal employees, travel expenses of individuals appointed for a limited term or on a temporary basis and transportation expenses of their immediate families and household goods and personal effects from their residence at the time of selection or assignment to their duty station. NSF may pay these same allowances to the same extent for such individuals' return to the former place of residence upon separation from the Federal service following an agreed period of service. NSF also may pay a per diem allowance to such individuals in lieu of and when less than payments for transportation of the immediate family and household goods and personal effects for the period of their employment with NSF.

The purpose of this new section is to authorize explicitly NSF's "Rotator" Program and permit payment of expenses and benefits needed to maintain the quality of its participants. The authority granted to NSF in this section, patterned on the Intergovernmental Personnel Act of 1970, will allow NSF to continue to augment its permanent staff of scientific and engineering employees with highly skilled persons on leave of absence from academia, industry, laboratories, and related agencies, institutions, and organizations, as it has done almost since its founding in 1950. The NSF Rotator Program provides NSF with professional and technical personnel who are current and experienced in academic, scientific, engineering, or managerial matters; and provides the individuals with experience and exposure to the philosophy and mechanisms of Federal support for research. The authority provided by this new section will assure that NSF can continue to attract high quality technical and professional personnel to serve as rotators within the existing Federal "pay caps" by permitting payment of rotator fringe benefits inured and costs usually incurred separately from salary. They will also remove any doubt about whether NSF can fund continued participation of a rotator in the Teachers Insurance and Annuity Association College Retirement Equities Fund (TIAA-CREF) and other non-Federal retirement, life insurance, and health benefit plans.

Section 107.—Stimulating Competitive Research

New section 107 amends NSF's organic act to make clear that one function of NSF is to foster and support efforts by those academic institutions and States which historically have received relatively little Federal research and development funding to improve the quality and competitiveness of their academic research programs and research infrastructures.

NSF already implements this policy, for example, through the Experimental Program to Stimulate Competitive Research and other programs. The Committee supports NSF's efforts in this regard. The Committee does not intend that NSF make any major changes in current policy as a result of this amendment. The Committee, however, does believe that such support is and should continue to be one of the fundamental responsibilities of NSF, and thus has codified it into law.

Section 108.—Study on Earthquake Engineering Research

This new section directs the National Academy of Sciences to conduct a study of current earthquake engineering efforts of the United States; requires that the results of this study be reported to Congress within 12 months after the date of enactment of this legislation; and authorizes the Academy to call upon Federal agencies while carrying out this study.

Both new advances in earthquake engineering and controversy over how best to allocate limited funds among individuals, groups, and centers make such a study timely. The Committee would like an objective study, with a study panel broadly representative of different fields of expertise and different parts of the United States. The Committee encourages NSF to support the study, but also encourages financial and other contributions from other Federal agencies.

Section 109.—Center for Earthquake Engineering Research

This new section directs NSF, as part of its third-year review of the National Center for Earthquake Engineering Research, to take such action as necessary to ensure that the review is conducted by an independent review panel; that the panel does not include any individual who receives significant amounts of funding from the Center or any individual who serves on any administrative committee of the Center; and that, among other things, the panel determine whether the Center is meeting all contractual goals and obligations, including matching funds requirements.

The Committee notes that NSF already plans an independent review of the Center; this section is intended simply to indicate the Committee's desire that the review be independent and thorough. By excluding from the review panel any individual who receives "significant amounts" of funding from the Center, the Committee intends that no individual who receives 25 percent or more of his or her research funding from the Center should serve on the review panel. In excluding individuals who serve on any "administrative" committee, board, or panel of the Center, the Committee intends to exclude individuals who play a role in governing the Center or allocating its funds. Serving on a research committee or

attending a seminar at the Center should not, by itself, exclude an individual from consideration for the review panel.

TITLE II—ACADEMIC RESEARCH FACILITIES MODERNIZATION

This Committee amendment is in lieu of the text of title II as included in the Labor Committee-reported version of S. 1632. The amended title establishes a new Academic Research Facilities Modernization Program at NSF.

Section 201.—Short Title

Section 201 provides that title II may be cited as the "Academic Research Facilities Modernization Act of 1988".

Section 202.—Findings and Purpose

Section 202 (a) provides a statement of findings and purpose. The congressional findings are as follows:

(1) the fundamental research and related education programs supported by the Federal Government and conducted by the Nation's universities and colleges are essential to our national security, and to our health, economic welfare, and general well-being;

(2) many national research and related education programs conducted by universities and colleges are now hindered by obsolete research buildings and equipment, and many institutions lack sufficient resources to repair, renovate, or replace their laboratories;

(3) the Nation's capacity to conduct high-quality research and education programs and to maintain its competitive position at the forefront of modern science, engineering, and technology is threatened by this research capital deficit, which poses serious and adverse consequences to our future national security, health, welfare, and ability to compete in the international marketplace;

(4) a national effort to spur reinvestment in research facilities is needed, and national, State, and local policies and cooperative programs are required that will yield maximum return on the investment of scarce national resources and sustain a commitment to excellence in research and education; and

(5) NSF, as part of its responsibility for maintaining the vitality of the Nation's academic research, and in partnership with the States, industry, and universities and colleges, must assist in enhancing the historic linkages between Federal investment in academic research and training and investment in the research capital base by reinvesting in the capital facilities which modern research and education programs require.

Section 202(b) states that the purpose of this title is to assist in revitalizing the Nation's academic research programs through capital investments in university and college science and engineering facilities primarily devoted to research.

Section 203.—Academic Research Facilities Modernization Program

Section 203(a) provides that the Director of NSF shall establish and carry out a new Academic Research Facilities Modernization

Program (hereafter in the discussion of this title referred to as the "Program"), under which awards are made to institutions of higher education for the repair, renovation, or, in exceptional cases, replacement of those institutions' obsolete science and engineering facilities primarily devoted to research.

The Committee intends the term "facilities primarily devoted to research" to mean buildings or other structures, or parts of buildings or other structures, used, in part or totally, for academic research. Such facilities include research laboratories and related support rooms and systems. Renovation of classrooms or libraries is not contemplated.

The Committee emphasizes that a "facility" need not be an entire building or structure. At times only part of a building may be devoted to research. A portion of a building, including a floor or even a single laboratory or other research-related room, shall be eligible for support under this program.

Moreover, the Committee intends that program assistance shall not be limited to facilities or institutions receiving only NSF or other Federal research funds. Facilities conducting research funded by State agencies, private sources, or the institutions themselves shall also be eligible. While the Committee anticipates that most of the research conducted in facilities assisted by this program will be conducted by faculty members, facilities in which research is conducted by students, including undergraduate students, shall not be excluded, providing that the research is a serious investigation of scientific or engineering phenomena.

Finally, in using the term "primarily devoted to research" the Committee notes that NSF is a research agency and that any NSF facilities program should be limited to facilities used, in total or in part, for research. The Higher Education Act, as amended, authorizes Department of Education grant and loan programs to assist colleges and universities with non-research facilities, including classrooms, libraries, and other types of buildings. However, by using the term "primarily devoted to research" the Committee does not intend that only facilities exclusively used for research should be eligible for assistance under this program. A given facility may be used for both research and other purposes. These unique circumstances should be addressed by NSF in the program plan called for under section 204(c).

Section 203(a) also provides that such assistance, consistent with the functions of NSF and through established NSF selection procedures, shall serve the following three objectives:

(A) the promotion of the modernization of graduate academic science and engineering laboratories and related facilities so as to facilitate and support the scientific and engineering disciplines;

(B) the assistance of those academic institutions that historically have received relatively little Federal research and development funds to improve their academic science and engineering infrastructures and broaden the Nation's science and engineering base; and

(C) the aiding of predominantly undergraduate colleges in the modernization of facilities devoted primarily to research.

In accordance with these objectives, the Committee believes that any NSF facilities program should assist the types of institutions and promote the goals as discussed below.

Leading research universities.—First, the facilities program should assist those institutions which perform most of U.S. academic research to modernize their research laboratories and related facilities so that they can perform the advanced research and related academic training on which the Nation fundamentally depends. Inadequate or obsolete laboratories hinder or prevent research-intensive universities from doing the high-quality research essential to maintaining world leadership in science and technology and a healthy and competitive economy.

Inflation has increased the cost of renovating and replacing university research facilities, and technological change has increased the demands on these facilities and their resulting cost. Because today's research requires ever more precise equipment and facilities and because of new health and safety regulations, the cost of performing this research has increased tremendously. In addition, in some cases yesterday's facilities and instruments simply cannot be used to perform today's or tomorrow's research. Biotechnology and semiconductor research are two examples.

As a result of these circumstances, serious facility deficiencies exist at many leading research institutions. NSF's 1986 survey of 165 doctorate granting institutions, entitled "Science and Engineering Facilities at Doctorate-Granting Institutions," found that 42 percent of the research facilities of the institutions that perform approximately 70 percent of Federally-sponsored academic research and development are in poor or fair condition. In 8 of 9 fields of science and engineering surveyed, more than half of existing facilities are in fair or poor condition. Over half of the facilities reported on in the survey were built or renovated before 1970; in the top universities that fraction is almost two-thirds. One-quarter of all facilities were built or renovated before 1960. Eight-nine percent of research administrators report that the number of research projects at their universities are limited by facilities, and 92 percent indicated that the type of research project undertaken is facilities limited. Forty-two percent of the top fifty research and development schools list facilities limitations as their most pressing research related need. The NSF survey confirms earlier studies done by the Association of American Universities.

The Committee believes that obsolete research laboratories at graduate institutions need to be modernized to perform leading edge research and train future scientists and engineers. There is a widespread view that facility deterioration has limited the number and type of research projects which can be undertaken by research faculty across nearly all major fields of science and engineering, which has adverse consequences for the pace and direction of research and the quality of advanced education programs for universities. Advanced research programs are at risk of losing their place on the cutting edge in both quality and productivity, promising lines of investigation are foreclosed, and efforts to recruit and retain the best researchers and graduate students become more difficult when candidates often are offered obsolete working environ-

ments. The Committee therefore intends that NSF strongly support efforts to upgrade research facilities at leading universities.

Emerging institutions.—Assistance to leading institutions is essential but should not be the only function of the Program. In addition, the Committee recognizes that research facilities and buildings are a form of infrastructure and that funding to modernize these facilities is a form of investment in the future. Thus, the Committee believes that another purpose of any NSF facilities program should be to broaden and strengthen the Nation's overall research infrastructure by devoting some portion of the program's funding to assist "emerging institutions" around the Nation to improve their research capabilities, so that they can perform better research and better compete for Federal research funding. By "emerging institutions" the Committee refers specifically, though not necessarily exclusively, to those academic institutions which are not among the Nation's top institutions in terms of Federal research and development funding.

The Committee notes that in recent years many States which historically have not received large amounts of Federal research funding have made serious commitments to improve the research capabilities of their universities. Other States which already have leading research universities have invested as well in their other universities and academic institutions. Some private universities also have made serious efforts to strengthen their research programs. Many of these State and private institutions are now becoming research universities in their own right. These schools not only contribute to the Nation as a whole; their research programs also benefit their local and regional economies.

Moreover, these emerging institutions have demonstrated facilities needs. The NSF facilities report mentioned earlier, "Science and Engineering Research Facilities at Doctorate-Granting Institutions," reached this conclusion (page xiv):

A majority of those officials responding for schools ranked below the top 50 rated the condition of their research facilities as fair to poor.

The Committee strongly believes that the NSF facilities program, as a form of infrastructure investment, should support high-quality facilities proposals from these emerging institutions. In this regard, the Committee emphasizes that any such facilities awards to emerging institutions should be made only through regular NSF procedures of competitive proposals and merit review. As provided in section 204(a)(2)(C), to the extent practical eligible academic institutions of a given type will compete against similar institutions for program awards.

Predominantly undergraduate institutions.—Finally, the Committee strongly believes that any NSF facilities program should also assist predominantly undergraduate and minority institutions to improve their facilities devoted primarily to research. The encouragement of well-trained undergraduate science and engineering majors at our Nation's colleges and universities is vital to the national security and economic competitiveness of this nation. The United States is not producing enough scientists and engineers to meet the future scientific needs of this country.

Historically, predominantly undergraduate institutions—schools with few or no doctoral or masters-level degree programs—have attracted high-ability science students. They produce a disproportionately large number of science and engineering bachelors degrees and serve as a primary pipeline for top graduate programs leading to the Ph.D. The Committee understands that undergraduate institutions produce a significant number of the students who go on to obtain Ph.D.s in the sciences, and that science majors comprise a larger percentage of undergraduate enrollments in these colleges than of larger research institutions. Since undergraduate colleges, primarily liberal arts colleges, graduate proportionately more Americans who become Ph.D.s in the sciences than other types of institutions, the quality of science facilities at these institutions is extremely important to ensure that this pool of scientists is trained in the most modern facilities possible.

The Committee recognizes that in undergraduate institutions facilities are configured differently than in graduate research institutions and that they also have different research priorities than do graduate research institutions. Specifically, it would be rare on an undergraduate campus to have an entire building devoted to science research activities. The more typical pattern would be a mixed-use building with classrooms and faculty offices, as well as laboratories and related facilities. If an entire building is not devoted to research, it would be the intention of this Committee to include funding for repair, renovation, or replacement of laboratories and related facilities used, in part or in total, for research within a building used for multiple purposes.

Research will have a different dimension in undergraduate institutions than in graduate research laboratories. As a general principle, research in undergraduate institutions frequently involves direct participation of undergraduates who prepare themselves for future science research careers as they and their instructors work on significant research problems. In this regard, the Committee intends to define research to encompass the research projects that typically are undertaken on an undergraduate campus. The Committee's intention is not to constrict the style of research that occurs on undergraduate campuses, but rather to support such research with adequate facilities.

The Committee considers that all three of the objectives listed in section 203(a)(2) are important, and that the Program should further all three of them. The Committee recognizes that NSF, after gathering relevant data and consulting with all relevant groups, is in the best position to make an informed judgment about how best to allocate limited facilities program funds to these three areas. However, the Committee intends that Program funds be appropriately allocated to meet all of the objectives of this title.

Section 203(b) provides that the Program shall be carried out through projects which involves the repair, renovation, or, in exceptional cases, replacement of specific science and engineering facilities devoted primarily to research at eligible universities and colleges, or consortia thereof, and for which funds are awarded in response to specific proposals submitted by such eligible universities and colleges or consortia in accordance with procedures prescribed by the Director pursuant to section 204.

Given the limited Federal funding available for academic research facilities, the Committee believes that the Program, in general, should focus on helping eligible institutions to repair or renovate existing facilities. However, in exceptional cases, an institution with a meritorious proposal may have a research facility which is so antiquated that replacement is the best option. An historically minority institution might be such an example.

Section 203(c) sets forth criteria for awards. Criteria for the award of funds to any institution for a project under the Program shall include—

- (1) the quality of the research and training to be carried out in the facility or facilities involved;
- (2) an analysis of the age and condition of existing research facilities and equipment;
- (3) the congruence of the institution's research activities with the future research needs of the Nation and the research mission of NSF;
- (4) the contribution which the project will make toward meeting national, regional, State, and institutional research and related training needs; and
- (5) in the case of an institution which historically has received relatively little Federal research and development funds, the contribution the proposed project will make to improving the institution's academic scientific and engineering infrastructure and broadening the Nation's science and engineering base.

The Committee stresses that NSF should fund only high-quality facilities proposals which demonstrate that the recipient will carry out high-quality research and training appropriate to each institution's purpose and missions. The Program should support facilities proposals from all types of eligible institutions, including both leading research universities and those emerging institutions and predominantly undergraduate and minority institutions which demonstrate a combination of need and, by the standards of these institutions, high-quality research and training.

Section 204.—Procedures, Surveys, and Planning Activities

Section 204(a) provides that the Director, consistent with the objectives of the Program and the criteria set forth in section 203(c), shall set forth procedures for the Program.

The procedures so prescribed shall contain such terms, conditions, and guidelines as may be necessary in the light of Program objectives, but shall in any event provide that—

- (1) funds to carry out the Program will be awarded to any university or college only on the basis of merit after a comprehensive review using established NSF procedures;
- (2) the membership of merit review panels that assess proposals will be broadly representative of eligible institutions, including research universities and predominantly undergraduate and minority institutions; and
- (3) the funds so awarded to any eligible institution or consortium thereof shall not pay for the entire cost of any such repair, renovation, or replacement project, with the balance of

project funds to be provided by the institution or consortium involved or from other non-Federal public or private sources.

The Committee emphasizes that NSF is to use established competitive selection procedures in reviewing program proposals and making awards. However, merit review panels should be broadly representative of the institutions and disciplines being considered.

The Committee strongly believes that applicants should provide firm commitments for non-Federal funds to match any NSF award. The Committee leaves the determination of specific matching requirements, as well as other terms and conditions, to NSF. In general, however, requiring matches which average 50 percent seems appropriate to the Committee. However, more affluent institutions may be able to provide matches greater than 50 percent, while less affluent universities and colleges, including many minority institutions, might be required to provide much less than 50 percent.

Section 204(b) provides planning authority. The Director shall conduct comprehensive planning activities, including surveys of research facility needs and other information-gathering activities, necessary to implement the program and to develop the procedures called for under subsection (a) of this section.

Section 204(c) provides for a comprehensive program plan. The Director, after gathering appropriate information and after consultation with the National Science Board, other appropriate Federal agencies, institutions of higher education, State governments, private foundations, and other appropriate organizations, shall develop a comprehensive program plan that:

- (1) defines the appropriate roles and responsibilities of the Federal Government, institutions of higher education, States governments, private foundations, and other appropriate organizations;

- (2) states appropriate ranges for NSF facilities assistance for various categories of eligible institutions, including predominantly undergraduate institutions as well as research universities; and

- (3) evaluates and addresses, to the maximum extent possible, a variety of factors which include, but are not limited to:

- (A) the conditions under which various amounts of cost sharing should be required (including conditions under which cost sharing might not be required) as well as limitations on award size and frequency;

- (B) the unique circumstances and research facilities needs of research universities, undergraduate institutions, and other institutions whose enrollment includes substantial percentages of minorities underrepresented in science and engineering;

- (C) innovative approaches in the management of the program that address both short-term and long-term aspects of the renovation, repair, and replacement of academic research facilities;

- (D) programmatic approaches that recognize and support excellence, strengthen scientific and engineering research potential and, to the maximum extent possible and consistent with the purposes of this legislation, assure an equita-

ble distribution of resources with respect to institutions and geographical areas; and

(E) any recommendations necessary to improve the Program and further meet the purposes of this title.

The Committee urges NSF to consider maximum amounts for Program awards and limitations on how often a single consortium or institution (or individual campus of a multi-campus institution) may receive or apply for Program awards.

The Committee expects the NSF program plan to recommend appropriate ranges of support for the main categories of institutions eligible for awards under this title—leading universities, emerging institutions, and predominantly undergraduate and minority institutions.

Section 204(d) provides that the Director shall prepare and submit a report of the plan required by subsection (c) of this section to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Labor and Human Resources and this Committee of the Senate not later than March 31, 1989. The Committee intends that, in the event facilities program funds are appropriated for FY 1989, no Program awards be made that fiscal year until after the report required by this subsection is submitted to those committees.

Section 204(e) provides that the Director, from amounts available to NSF in any category described in Section 101(b)(1) for fiscal year 1989, may make available an amount, not to exceed \$1,000,000, to carry out the provisions of this section. The Committee intends that these funds be used to prepare the Program plan and associated report.

Section 205.—Set-Aside for Certain Institutions

This section provides a programs set-aside for certain institutions. Of the amounts appropriated to NSF for the facilities program established under this title, in each fiscal year, at least 10 percent of the funds shall be reserved for institutions of higher education whose enrollment includes substantial percentages of minorities underrepresented in science and engineering.

The Committee believes that these institutions have a demonstrated need for improved facilities. Moreover, aiding them is one of the best investments the Nation can make in its economic future. These institutions historically have trained a high percentage of the minority students who go on to attain advanced degrees in science and engineering. At a time when the Nation needs to train many more minority scientists and engineers, these institutions have become even more valuable.

TITLE III—UNDERGRADUATE SCIENCE AND ENGINEERING IMPROVEMENT PROGRAM

This amendment adds a title III to the bill reported by the Labor Committee, to establish an Undergraduate Science and Engineering Improvement Program at NSF.

Section 301.—Short Title

This section provides that title III may be cited as the "Undergraduate Science and Engineering Improvement Act of 1988".

Section 302.—Purpose

This section states that it is the purpose of this title to assist in revitalizing the Nation's academic programs in the sciences and engineering at the undergraduate level at institutions of higher education through investments in such activities as instrumentation and laboratory improvement; undergraduate faculty enhancement; undergraduate curriculum development; and special efforts designed to increase the presence of minorities, women, and the disabled in science and engineering.

The Committee strongly supports an expansion of the current undergraduate initiative at NSF. The Committee particularly supports the equipment portion of the initiative. Testimony before the Committee stated that undergraduate programs need state-of-the-art equipment—such as lasers and advanced chemistry instruments—in order to provide high-quality training to their students. Many undergraduate programs lack such new equipment, however. The Committee's intention in this title is to establish the existing program in law, while the FY 1989 authorization in title I provides an additional \$30,000,000 for this initiative.

Section 303.—Undergraduate Science and Engineering Improvement Program

Subsection (a) states that in order to carry out this title, NSF shall implement a comprehensive Undergraduate Science and Engineering Improvement Program (hereafter in the discussion of this title referred to as the "Program") under which awards shall be made to institutions of higher education for projects designed to improve the state of undergraduate science and engineering education.

Subsection (b) states that funds will be awarded in accordance with procedures prescribed by the NSF Director with the objective of carrying out the purpose of this title. The procedures so prescribed shall contain such terms, conditions, and guidelines as may be necessary in the light of that objective, but shall in any event provide that funds to carry out the Program will be awarded only on the basis of merit after a comprehensive review using established NSF procedures.

TITLE IV—COLLEGE AND UNIVERSITY INNOVATION RESEARCH PROGRAM

This amendment adds a title IV to the bill reported by the Labor Committee.

Section 401.—Short Title

This section provides that title IV may be cited as the "College and University Innovation Research Program Act of 1988."

Section 402.—Findings and Purpose

Section 402(a) states that the Congress finds and declares that—

(1) research by scientists and engineers at U.S. colleges and universities can contribute significantly to local economic development and to the long-term economic competitiveness of the Nation;

(2) Federal research funds remain limited, especially for academic research which develops prototype inventions and processes with economic potential;

(3) researchers in colleges and universities which traditionally receive little Federal research and development funding, including researchers in predominantly undergraduate institutions, have considerable difficulty obtaining funding which allows them to pursue innovative research of economic potential;

(4) a research funding program which recoups some of the monies it awards, over time, could approach self-sufficiency, generating further funds for research support;

(5) the Small Business Innovation Research Program, created by the Small Business Innovation Development Act of 1982, provides a proven mechanism for the support of high-quality innovative research; and

(6) a new pilot research program, based on the Small Business Innovation Research Program model but focused on faculty researchers and providing both a recoupment mechanism and attention to the needs of qualified researchers at a wide range of colleges and universities, would make a valuable contribution to the Nation.

Subsection (b) states that it is the purpose of this title to establish a 5-year pilot program at NSF, to assist academic researchers at a wide range of colleges and universities to pursue high-quality research of economic potential.

Section 403.—Definitions

This section provides that as used in this title—

(1) the term "eligible faculty member" refers to any person employed more than 25 percent of his or her working time by an institution conducting both research and educational activities and qualifying for tax exemption under section 501(c)(3) of the Internal Revenue Code of 1986 or its successors;

(2) the term "forgivable loan" refers to a loan which need not be repaid in part or in full, if the research supported in part or in total by the loan does not lead to a commercial product or service which generates profits or other revenues;

(3) the terms "research" and "research and development" have the definitions provided in Office of Management and Budget Circular A-11 or its successors; and

(4) the term "qualifying small business" refers to any company eligible of competing in NSF's Small Business Innovation Research Program.

Section 404.—College and University Innovation Research Program

Section 404(a) requires the NSF Director to establish and operate a pilot activity known as the College and University Innovation Research Program (hereafter in the discussion of this title referred to as the "Program").

Section 404(b) authorizes Program awards. Under the Program, the Director is authorized to make grants and provide forgivable loans to eligible faculty members for research in science, engineering, and mathematics. Awards shall be available in three phases—

(1) Phase I, under which and in response to annual Program solicitations, eligible faculty members may apply for Program funding to conduct studies exploring problems in basic research and examining the feasibility of developing new technology, products, or services on the basis of the knowledge gained through such studies;

(2) Phase II, in which Phase I awardees who have successfully reached their Phase I research objectives, or who have shown the feasibility of developing new technology, products, or services on the basis of research conducted under another research project funded by NSF, may apply for additional funding to conduct further research designed to advance the new technology, product, or service to the prototype stage; and

(3) Phase III, which shall be funded by sources other than NSF and which shall support research and development to create new domestically-manufactured products, processes, and services.

In stating that the awards should be a mix of grants and forgivable loans, the Committee emphasizes that one purpose of the Program is to explore and test the possibility of recouping some portion of the funds awarded under the Program. In order to generate additional Program funds, the Committee directs NSF to include, to the extent practical, a forgivable loan component in the Program. The Committee also urges the Director, to the extent practical, to test other recoupment methods.

Section 404(c) deals with procedures. The NSF Director shall establish such Program procedures as the Director deems appropriate, except that the Director shall—

(1) utilize established NSF procedures which involve the review of proposals on the basis of scientific and technical merit;

(2) in the case of Phase I applications of approximately equal scientific and technical merit, generally give preference to proposals from faculty members serving at colleges and universities which historically have received relatively little Federal research or research and development funding;

(3) in the case of Phase II applications ranked highly on the basis of scientific and technical merit, generally give preference to proposals—

(A) which include commitments for follow-on Phase III funding from sources other than NSF;

(B) which contain a plan for transferring any information, technology, or products resulting from the project to a qualified small business; and

(C) which come from faculty members serving at colleges and universities which historically have received relatively little Federal research or research and development funding; and

(4) to extent appropriate, utilize the procedures and application forms used in NSF's Small Business Innovation Research Program.

The Committee emphasizes that all proposals must first go through regular competitive review. However, among the proposals that are highly ranked by such review, the Committee believes that generally preference should be given to proposals from researchers at colleges and universities which historically have received relatively little Federal research or research and development funding. These scientists and engineers frequently have particular problems getting research funding or obtaining release time from teaching. The Committee also intends that the term "faculty member" be interpreted broadly, to include instructors, lecturers, research associates, and adjunct professors as well as regular faculty.

Section 404(d) deals with terms and conditions. The NSF Director shall set forth such terms and conditions regarding Program awards, including the mix of grants and forgivable loans to be made to awardees and the terms of any forgivable loans, as the Director deems appropriate, except that—

(1) no Phase I award (including the loan component thereof) shall exceed \$150,000 nor extend beyond three years;

(2) no Phase II award (including the loan component thereof) shall exceed \$500,000 nor extend beyond two years.

Section 404(e) states consultation requirements. Before specifying Program procedures and terms and conditions, the NSF Director shall, as appropriate, consult with the National Science Board, the Secretary of Commerce, other Federal agencies, institutions of higher learning, business leaders, private foundations, and other organizations.

Section 404(f) provides a sunset provision. Authority to operate the Program shall expire 5 years after the date of enactment of this Act, unless such authority is extended by future Acts.

Section 405.—Revolving Fund

Section 405(a) establishes an NSF revolving fund for the Program. The NSF Director is authorized to establish and operate, within the Foundation, a College and University Innovation Research Program Revolving Fund. Any moneys paid back to the Foundation under the terms of Program forgivable loans or such other arrangements for Program recoupment as may be specified by the Director shall be deposited into the Revolving Fund, and shall be used to help support additional Program awards.

The Committee intends that NSF establish and operate the Revolving Fund in conformance with all applicable regulations and guidelines established by law, by the Office of Management and Budget, and by the General Accounting Office.

Section 405(b) deals with the disposition of funds in the Revolving Fund. Five years after the date of enactment of this Act, unless the Program is extended by future statute, any remaining moneys in the Revolving Fund shall be transferred to the Treasury.

Section 406.—Reports

Section 406(a) requires an initial report. Within one year after the date of enactment of this legislation, the NSF Director shall

submit to the Congress a detailed report describing the procedures and terms and conditions specified for the Program. The report should also include a statement of the progress of the Program to that date. Such report shall include an analysis of how forgivable loans and alternative mechanisms might be used to recoup funds for both the Program and other Federal research activities.

Section 406(b) requires a second report. Three years after the date of enactment of this legislation, the NSF Director shall submit a second report which—

- (1) evaluates program success and assesses the utility of extending the Program to other Federal agencies;
- (2) assesses the quality of research supported by the program, its scientific and technical merit, its effects on broadening the Nation's research capabilities and base, and its effects on local economic development and national economic competitiveness; and
- (3) recommends improvements, modifications, and other changes which should be made in the Program.

Since this is a pilot program, the Committee requests that NSF perform a full evaluation of the Program and report on the Program's accomplishments, strengths, and weaknesses, as well as provide any recommendations that NSF may have regarding current or possible future operation of the Program.

TITLE V—EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH

This amendment adds a title V to the bill reported by the Labor Committee.

Section 501.—Experimental Program to Stimulate Competitive Research

Section 501(a) codifies an existing NSF program, the Experimental Program to Stimulate Competitive Research (EPSCOR). The NSF Director is directed to continue to operate EPSCOR, the purpose of which is to assist those States which—

- (1) historically have received relatively little Federal research and development funding; and
- (2) have demonstrated a commitment to improve science and engineering research programs at their universities and colleges.

The Committee believes that EPSCOR is an effective and high-quality mechanism to strengthen research and research universities in those States which historically have received the least Federal research funding. In 1980, NSF made five-year awards to five States: Arkansas, Maine, Montana, South Carolina, and West Virginia. In 1986, NSF made eight additional awards: Alabama, Kentucky, Nevada, North Dakota, Oklahoma, Puerto Rico, Vermont, and Wyoming. Four other States are currently eligible to apply: Idaho, Louisiana, Mississippi, and South Dakota.

Section 501(b) deals with terms and conditions of program awards. In carrying out the EPSCOR program, the NSF Director shall set forth such terms and conditions for making awards under the program as the Director deems appropriate, except that in all

cases States must commit matching funds and formulate a plan for how to build research capabilities before the Director may make an award under this program.

The Committee believes that a strong State commitment, including the providing of matching funds, and a well-formulated plan for investing EPSCOR research funds are essential prerequisites for a successful State EPSCOR effort. The Committee agrees with NSF's current policy of not awarding EPSCOR funds to any eligible State until it provides adequate matching funds and an acceptable State plan.

Section 501(c) authorizes second awards. Each State which has received an initial award under the EPSCOR program, or which receives an initial program award subsequent to the date of enactment of this title, shall be eligible for an additional five years of support, on the condition that the State provides assurances of new matching funds and submits an acceptable new plan for how it will use program funds and matching funds to build its research capabilities.

While EPSCOR has been successful in several participating States, the Committee believes that participating States could benefit from additional years of funding. In some States, five years simply is not enough to build a self-sustaining research program. Other States do well in five years, but could use additional funding to strengthen academic departments and universities which were not covered in the initial plan and funding. The Committee emphasizes that before any participating States receives additional funding, it must once again offer sufficient matching funds and an acceptable plan for investing program funds.

The Committee also emphasizes that each of the four States now eligible for initial awards but which have not yet received them at the date of enactment of this title, if they subsequently receive an initial EPSCOR award, will be eligible to apply for the additional five years of support.

Section 502.—Additional Activities

Section 502 states that the NSF Director, as appropriate, may undertake other steps to assist States participating in the program to improve their research base and become more competitive, including but not limited to—

- (1) The sponsorship of workshops and other activities to assist faculty in writing proposals; and
- (2) The arrangement of training, at NSF, for individuals who can return to their States and advise faculty on NSF program opportunities and procedures.

The Committee recognizes researchers in EPSCOR States often lack first-hand familiarity with NSF procedures and the best way to write proposals to NSF. Workshops and possible programs at NSF to help train individuals from these States could help a great deal, and the Committee wants to ensure that NSF has the authority to offer such assistance.

By authorizing NSF to provide such assistance to EPSCOR States, the Committee in no way wishes to imply that NSF cannot use its general authority to provide similar assistance to non-EPSCOR States. The Committee encourages NSF to provide such assistance, as appropriate, to all interested States.

ADDITIONAL VIEWS

Increasing the support for university research is important for the training of future scientists and engineers. I support the Committee's doubling of the National Science Foundation (NSF) authorization over the next five years and the establishment of a facilities program for graduate and undergraduate colleges and universities.

Maintaining our research excellence requires that we fund those proposals judged to be of the highest quality by the academic and scientific community. Research projects should be funded on the basis of merit. The Committee's authorization, however, contains several earmarks that increase the budget for specific research areas in response to various political pressures. This inhibits the ability of NSF to allocate scarce funding to the most productive research activities.

While I am generally opposed to the specific earmarks in this bill, I am particularly opposed to the language in this report instructing NSF, in allocating \$3 million for research into ocean engineering systems, "to pay particular attention to the needs and technical opportunities of ocean engineering efforts in the Pacific Basin." Beyond the brief explanation that the resources of the Pacific Basin would be more valuable if new technologies can be developed, no justification, let alone scientific or technical documentation, is offered as to why funding for this area should be increased to the detriment of other research areas.

More importantly, there was no reference in the Committee's bill and there was no discussion at the Committee's Executive Session that the increase in ocean engineering would be limited to the Pacific Basin. This limitation has been inserted in the Committee's report after the Committee met and despite the fact that none of the Committee members discussed or voted on this limitation. As a result, I do not consider such language to be binding on the NSF, and suggest that its inclusion in this report is inappropriate.

JACK DANFORTH.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the portions of the reported bill that have been added by the Committee are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new material is printed in italic, existing law in which no change is proposed is shown in roman):

THE NATIONAL SCIENCE FOUNDATION ACT OF 1950

SECTION 3 OF THAT ACT

SEC. 3. (a) The Foundation is authorized and directed—

(1) through (4) * * *

(5) to foster and support efforts by those academic institutions and States that historically have received relatively little Federal research and development funding to improve the quality and competitiveness of their academic research programs and research infrastructures;

[(5)] (6) to evaluate the status and needs of the various sciences and fields of engineering as evidenced by programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups, employing by grant or contract such consulting services as it may deem necessary for the purpose of such evaluations; and to take into consideration the results of such evaluations in correlating the research and educational programs undertaken or supported by the Foundation with programs, projects, and studies undertaken by agencies of the Federal Government, by individuals, and by public and private research groups;

[(6)] (7) to provide a central clearinghouse for the collection, interpretation, and analysis of data on scientific and engineering resources and to provide a source of information for policy formulation by other agencies of the Federal Government; and

[(7)] (8) to initiate and maintain a program for the determination of the total amount of money for scientific and engineering research, including money allocated for the construction of the facilities wherein such research is conducted, received by each educational institution and appropriate non-profit organization in the United States, by grant, contract, or other arrangement from agencies of the Federal Government, and to report annually thereon to the President and the Congress.

(b) through (f) * * *

SECTION 14 OF THAT ACT

SEC. 14. (a)(1) The Director shall, in accordance with such policies as the Board shall from time to time prescribe, appoint and fix the compensation of such personnel as may be necessary to carry out the provisions of this Act. Except as provided in section 4(h), such appointments shall be made and such compensation shall be fixed in accordance with the provisions of title 5, United States Code, governing appointments in the competitive service, and the provisions of chapter 51 and subchapter III of chapter 53 of such title relating to classification and General Schedule pay rates: *Provided*, That the Director may, in accordance with such policies as the Board shall from time to time prescribe, employ such technical and professional personnel and fix their compensation, without regard to such provisions, as he may deem necessary for the discharge of the responsibilities of the Foundation under this Act. The members of the special commissions shall be appointed without regard to the provisions of title 5, United States Code, governing appointments in the competitive service.

(2) *The Director may, under the authority provided by paragraph (1) of this subsection and in accordance with such policies as the Board chooses to prescribe, appoint for a limited term, or on a temporary basis, scientists, engineers, and other technical and professional personnel on leave of absence from academic, industrial, or research institutions to work for the Foundation.*

(3) *The Foundation may, to the extent authorized for certain other Federal employees by section 5723 of title 5, United States Code, pay—*

(A) *Travel expenses of any individual appointed under this subsection for a limited term or on a temporary basis; and*

(B) *transportation expenses of his or her immediate family and his or her household goods and personal effects;*

from that individual's place of residence at the time of selection or assignment to his or her duty station. The Foundation may pay such travel expenses and transportation expenses to the same extent for such an individual's return to the former place of residence from his or her duty station, upon separation from the Federal service following an agreed period of service. The Foundation may also pay a per diem allowance at a rate not to exceed the daily amounts prescribed under section 5702 of title 5, United States Code, to such an individual, in lieu of and when less than transportation expenses of the immediate family and household goods and personal effects, for the period of his or her employment with the Foundation. Notwithstanding any other provision of law, the employer's contribution to any retirement, life insurance, or health benefit plan for an individual appointed for a term of one year or less, which could be extended for no more than one additional year, may be made or reimbursed from appropriations available to the Foundation.

(b) through (i) * * *